DESIGN

FOR AN

INTERLOCKING PLANT

BY

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THESIS

FOR

DEGREE OF BACHELOR OF SCIENCE

IN

CIVIL ENGINEERING

COLLEGE OF ENGINEERING

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THIS IS TO CERTIFY THAT THE THESIS PREPARED UNDER MY SUPERVISION BY

CARL WILLIAM SIMPSON

ENTITLED DESIGN FOR AN INTERLOCKING PLANT

IS APPROVED BY ME AS FULFILLING THIS PART OF THE REQUIREMENTS FOR THE DEGREE

OF Bachelor of Science in Civil Engineering.

Ira O. Baker

HEAD OF DEPARTMENT OF Civil Engineering

Introduction

The present traffic on the Illinois Central and C.C.C. + St.L. Railways makes an interlocked crossing advisable, and should this traffic continue to grow at its present rate of increase, such a crossing will soon become a necessity.

The system, as presented in this design, provides for the complete interlocking of the crossing, and of all adjacent secondary tracks, in such a manner as to facilitate traffic and insure absolute safety.

By changing the position of some of the lead-outs the system could be greatly simplified and its cost considerably reduced. The system, as herein presented, is designed, however, to protect the tracks as they are at present located.

Description of Crossing.

The C.C.C. & St.L. and the Wabash Railways cross the Illinois Central Railway in Champaign, at a point about fifteen hundred feet from each of the three depots.

The Illinois Central is a double track road running approximately north and south, both tracks being on a comparatively level grade and on a six-foot embankment. A cross-over connects the two main tracks just north of the crossing. There are also two secondary tracks,— one, leading north from the north-bound main line, begins thirty feet north of the north end of the cross-over; and the other, leading south from the south-bound main line, begins about eighty feet south of the crossing.

The C.C.C. & St.L. and the Wabash Railways are single track roads, running approximately east and west. Both roads cross the Illinois

Central at practically a right angle, and are about ninety feet center to center at the crossing.

Two transfer tracks connect the Illinois Central south bound main line with the C.C.C. & St.L. and Wabash tracks respectively. The switch points of the one connected with the C.C.C. & St.L. are located in advance of the home signals, and are therefore not worked from the tower, but are locked in connection with the distant signals. The one connected with the Wabash is used by the Illinois Central as a main line for its Havana traffic. In addition to the above a secondary track leads west from the C.C.C. & St.L. just west of the crossing.

The yards of all three roads are located near the crossing and switch engines frequently pass over it.

Interlocking Machine.

The National Interlocking Machine, manufactured by the National Switch and Signal Company, is used in this design. All the parts of this machine, by which the locking is accomplished, are carried on the main frame beneath the floor of the tower, nothing being placed above the frame except the lever. The rocker is suspended underneath the frame, the latch rod being brought down to engage and move it whenever the latch is raised or released. A link connects the rocker with a tappet bar, and prevents the rocker from being moved, unless the locking dogs, carried in the frame behind the tappet bar, are in such a position as will permit the tappet bars to be moved.

The locking is accomplished by means of a tappet bar moving at right angles to a dog which fits in a notch cut in the edge of the

bar. This dog is made longer than the distance between any two tappet bars, the levers of which it is desired to lock, so that one bar will be free to move only when the dog slides into the notch cut in the other bar. The dogs are made by screwing small tapped plates to a narrow bar of such length as will cause the plates to fit in the tappet bar notches. As the width of the plates is three times that of the connecting bar, three dogs may be arranged to work in the same space by using top, middle, and bottom bars. In this way a large amount of locking may be accomplished in a small space, and at the same time so arranged as to be easily accessable for cleaning, repairing, or changing.

Selector Bars.

One selector will be used in the tower. It will be operated by the lever which operates

the cross-over and will cause levers two and three to operate the proper signals, as indicated on Plate II.

Style of Signals.

The signals are of the semaphore type, and are so constructed as to go to the danger position by force of gravity in case the connections between the operating lever and the signal are broken. Each signal is provided with a lamp having a properly focused front lense and a back light.

The normal position of all signals is at danger, which is indicated during the day by the arm extended horizontally from the right-hand side of the post, and during the night by a red light.

Home Signals.

The home signal is located on the engineman's side of the track, fifty feet in advance of the derail or switch that is governed by it.

When the derail or facing point is set against the movement of trains governed by the home signal, the signal is locked in a horizontal position and shows a red light by night.

When the track it governs is clear and safe for the passage of trains the signal will be inclined at an angle of about seventy five degrees and will show a white light by night.

When two signal arms are used on the same post the upper signal governs the main route and the lower signal the secondary or diverging route.

Distant Signals.

The distant signal is located twelve hundred feet in advance of the home signal with which it operates, and on the same side of the track with the arm pointing in the same direction. The distant signal is distinguished from the home signal by a notch cut in the end of the arm. It is so arranged that it will be held in a horizontal position and show a green light by night when the home signal indicates danger.

Dwarf Signals.

Dwarf signals have a small arm placed at a suitable height, and are similar in design and location to the home signal.

The dwarf signal will be used to govern the movements of trains as follows: from secondary tracks to main or other secondary tracks, on cross-

overs, and on all back-up movements.

Rotating Indicator.

One rotating disk or "pot" signal will be used. It will govern movements from the Illinois Central south-bound main line to the coal-yard track, and will operate with the switch.

Bracket Posts.

One bracket post is used, as it is impracticable, in one case, to use separate posts. The position of the posts on the bracket corresponds with the position of the tracks on which movements are governed.

Details of Posts.

Single posts are ten inches square at the base and six inches square at the top. Bracket

posts are ten by twelve inches throughout. The greatest dimension being perpendicular to the bracket. The cross-arm, formed of two pieces of three by twelve inch plank, is twenty feet above the top of the rail, and supports two posts seven inches square and seven feet long, spaced six feet apart.

All posts are to be set seven feet clear of the rail.

Derails

Two derails are used on each main track; one on each side of the crossing. A derail is used on each secondary track to protect the main track from which it leads. The crossing of the south transfer track and the Illinois Central coal yard track is protected on one side by a derail and on the other by a worked switch which affords the same amount

of protection as would a derail.

On main tracks the derail is placed five hundred feet in advance of the fouling point which it protects. Guard-rails are used at all main line derails. The derails on secondary tracks, and those provided for back-up movements, are placed from one hundred and fifty to two hundred feet in advance of the fouling point protected by them.

All derails and switches are operated by an iron pipe line one inch inside diameter, coupled by means of sleeves, plugs, and rivets in the usual manner.

Facing-point Locks.

All derails and switches are provided with facing-point locks, of standard form, placed between the rails.

Detector Bars.

All derails, worked switches, and crossings are protected by detector bars fifty five feet in length. Where more than one route may be opened at a worked switch a detector bar is provided for each route.

The first interval of the lever movement raises the detector bar above the rail at the same time that the lock-pin is withdrawn. The final movement of the lever advances the detector bar to its normal position.

Bolt Locks.

The transfer track, connecting the Illinois Central and the C.C.C.+St.L., leads from the main lines in advance of the home signals and is therefore not included in the locking system. The points of connection are in rear of the distant signals, and will be protected

by means of bolt-locks having independent connections with the switch points and operated in connection with the distant signals.

Compensators.

Each pipe line is provided with automatic compensators at such intervals as will accomidate any expansion or contraction that may take place.

The wire lines are provided with automatic compensators and in addition have a sleeve nut at each end capable of making an adjustment of twelve inches.

Foundations.

The combination castiron and wood foundations, manufactured by the Standard Railroad Signal Company, will be used for all compensators, cranks, chain-wheels, dwarf signals,

lock mechanisms, and pipe carriers.

High signals will be set in concrete foundations. All wood comming in contact with the ground will be creosoted.

Painting.

The levers of the interlocking machine are painted in such a manner as to indicate their use, i.e. distant signal levers, green; home and dwarf signal levers, red; switch and derail levers, black; lock levers, blue; switch and lock movement levers, blue and black; and crossing-bar levers, yellow.

The pipe lines will be painted with two coats of red lidd and linseed oil, and a third coat of some suitable color will then be applied.

High-signal arms are painted yellow on the face and white on the back. A black band

six inches wide is painted across both face and back about one foot from the end.

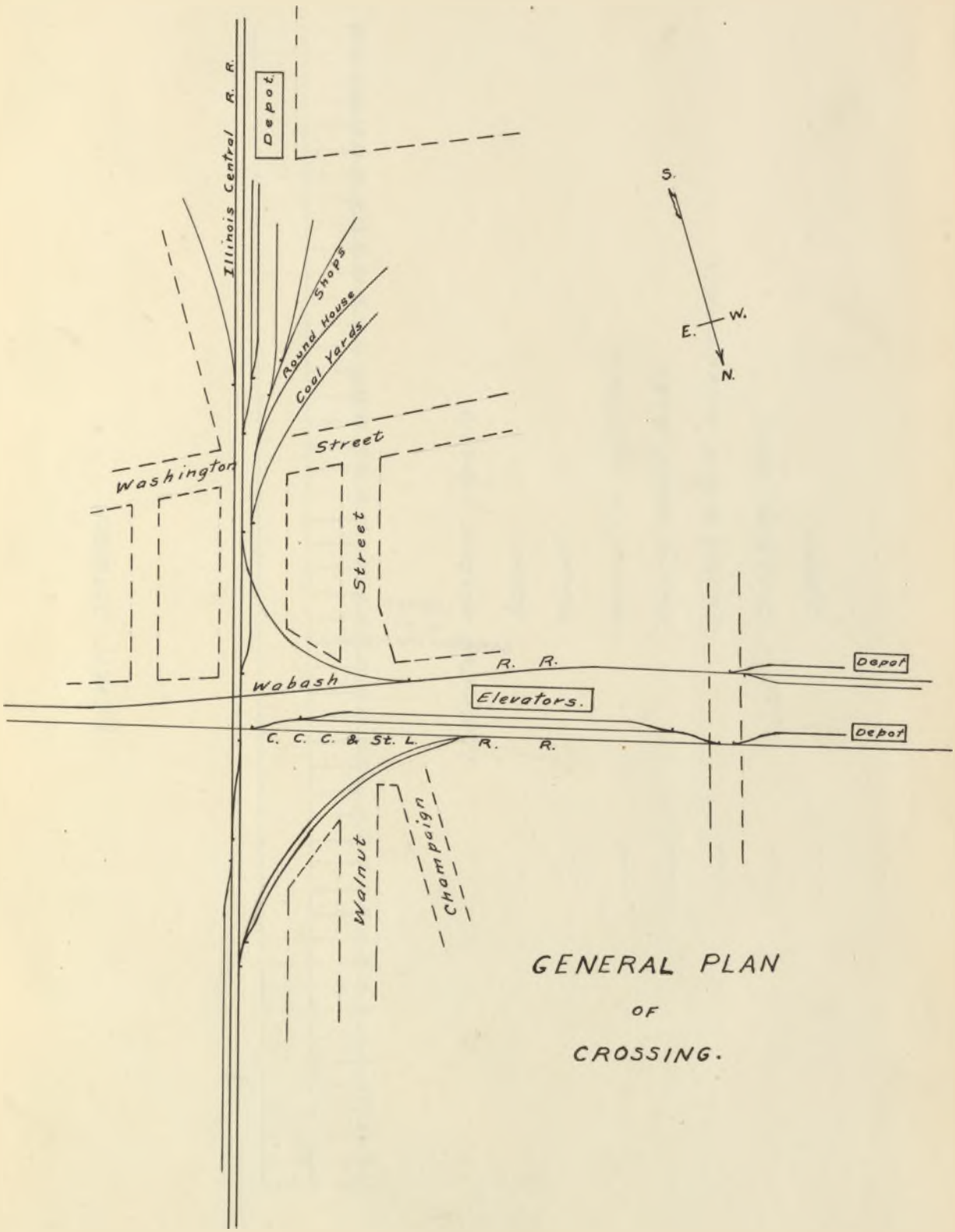
Tower.

A brick tower will be placed between the Wabash and the C.C.C.&St.L. tracks just east of the Illinois Central northbound track.

The windows of the lever room will be twenty feet above the rail and will give an unobstructed view of all tracks and signals.

The tower will be twelve by thirty feet in plan, the longer dimension being parallel with the Illinois Central main tracks.

PLATE I.

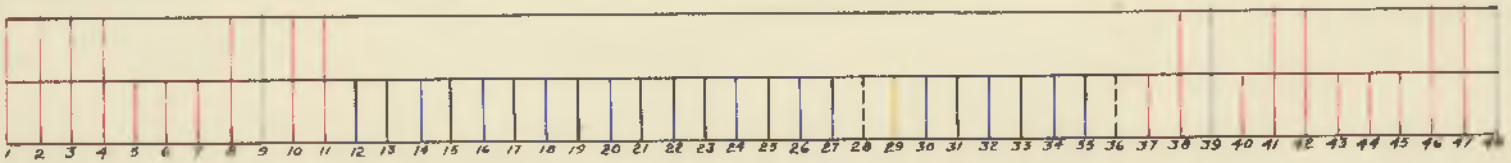


GENERAL PLAN

OF

CROSSING.

LEVER DIAGRAM



Indicates distant signals.

" home "

" dwarf "

" derails & switches.

" facing point locks.

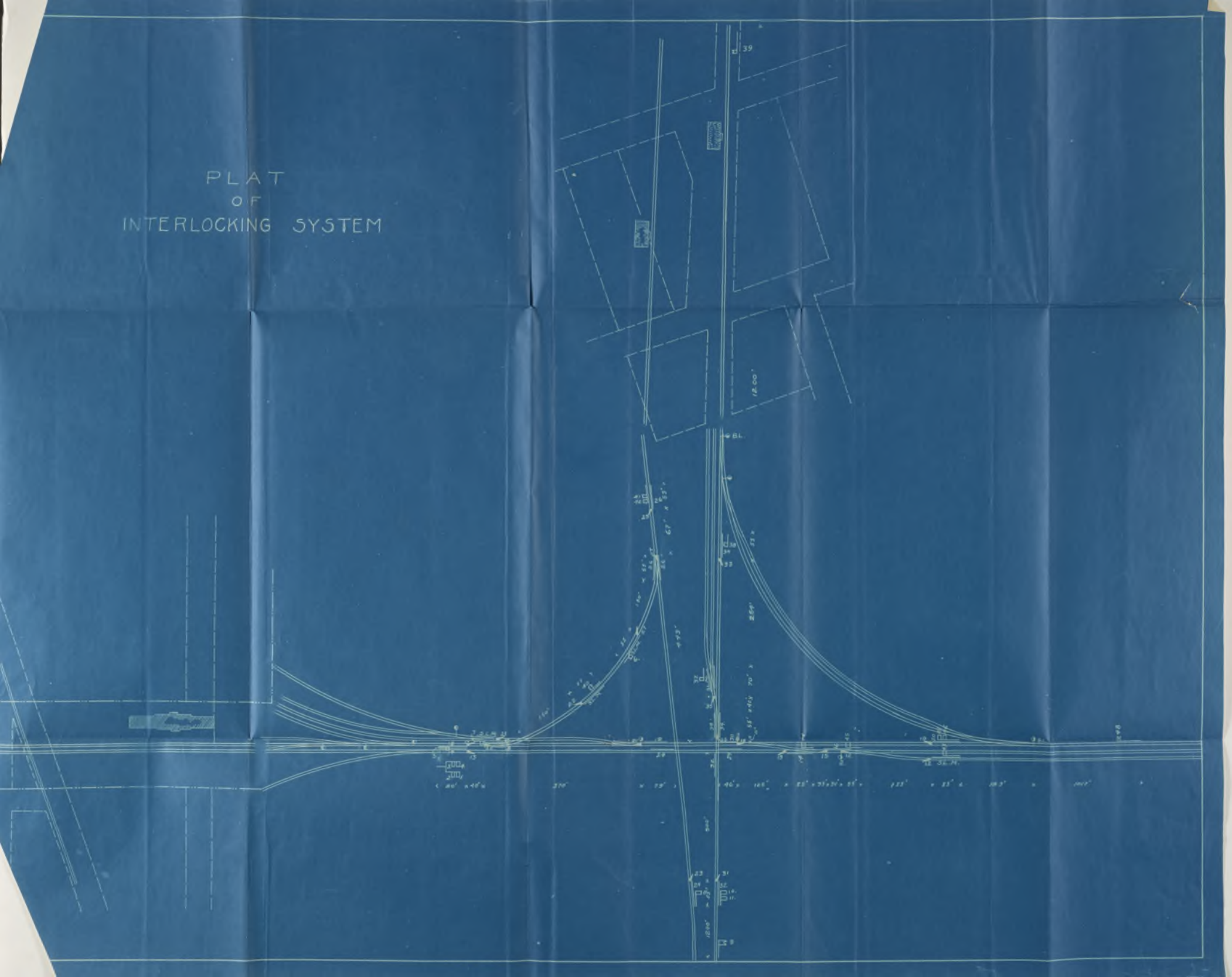
" switch & lock movements.

" crossing bars.

" spare.

PLATE III.

PLAT
OF
INTERLOCKING SYSTEM



DOG SHEET

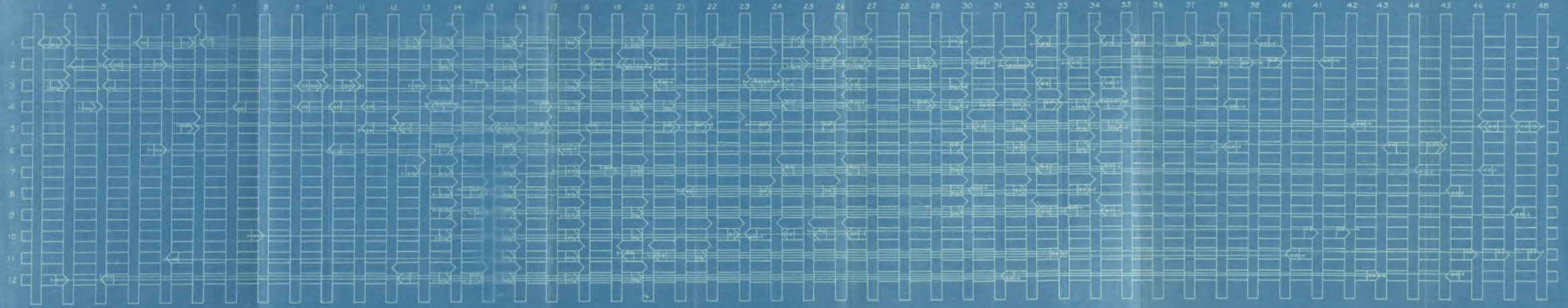


PLATE IV.

LOCKING SHEET.

Lever	Locks
1	2 (2) (13) (14) (16)
2	(12) (14) (16)
3	2 (2) (14) (15) (16) (18) (30)
4	(6) (18) (30)
5	3 (3) (16) (18) (20) (22) (30)
6	(25) (26) (27)
7	3 (3) (18) (20) (21) (30)
8	(24) (26)
9	(10) (11) (31) (32)
10	(31) (32) (34)
11	(31) (32) (34) (35)
12	S.L. & M.
13	Derail - (24) (26) (32) (34)
14	13 (13)
15	(20) (32) (34)
16	15 (15) 12 (12)
17	Derail (24) (26)
18	(6) 17 (17) 21 (21) 22 (22)
19	Derail (24) (26) (32) (34)
20	19 (19)
21	S. & L. M. (24) (26) (32) (34)
22	S. & L. M. (20)
23	Derail (14) (16) (18) (20)
24	23 (23)
25	Derail
26	25 (25) 27 (27) 29 (29)
27	S. & L. M.
28	Spare.
29	Crossing Bar.
30	15 (15)
31	Derail (14) (16) (18) (20)
32	31 (31)
33	Derail (14) (16) (20)
34	29 (29) 33 (33) 35 (35)
35	S. & L. M.
36	Spare
37	(32) (34) (35)
38	(32) (33) (34)
39	(33) (38)
40	(16) (18) (22)
41	(25) (26) (40)
42	(24) (25) (26)
43	(12) (14) (16) (30) 45 (45)
44	(13) (14) (16)
45	(14) (15) (16) (18) (30)
46	(18) (19) (20) (30)
47	(18) (19) (20) (30)
48	(19) (30) (46) (47)

PLATE V.

MANIPULATION

SHEETS.

Illinois Central, – North-Bound.

North-Bound Main Track (34) (32) (24) (26) 12 15 (16) (13) (14) (1).

South-Bound Main Track (34) (32) (24) (26) (19) (20) 15 (30) 21 22 (17) (18) (5).

Coal Yards to S.-B. Main Track (34) (32) (24) (26) (19) (20) 15 (30) (21) 22 17 (18) (7)

Coal Yards to N.-B. Main Track (34) (32) (24) (26) 19 (20) 12 (15) (16) (30) (21) 22 17 (18) 13 (14) (2) (3) (7)

S.-B. Main Track to "Y." 19 (20) 15 (30) 23 (24) 21 (25) (27) (26) (6) (22) (17) (18) (4)

S.-B. Main Track to N.-B. Main T. (34) (32) (24) (26) 13 (14) 19 (20) 12 (15) (16) (30) 21 22 (17) (18) (3) (5)

S.-B. Main Track to Siding (34) (32) (24) (26) 13 (14) 19 (20) (12) (15) (16) (30) 21 22 (17) (18) (2) (3)

N.-B. Main Track to Siding (34) (32) (24) (26) (12) 15 (16) (13) (14) (2)

Coal Yards to Siding (34) (32) (24) (26) 13 (14) 19 (20) 17 22 (21) (18) (15) (30) (12) (16) (2) (3) (7)

Illinois Central - South-Bound.

South-Bound Main Track (34) (32) (24) (26) (17) 22 21 (18) 15 (30) (19) (20) (47) (48)

North-Bound Main Track (34) (32) (24) (26) (13) (14) 15 12 (16) (44)

N. B. Main Track to S.-B. Main T. (34) (32) (24) (26) 13 (14) (17) 22 21 (18) 19 (20) (15) (30) (12) (16) (45)

N.-B. Main Track to Coal Yards (34) (32) (24) (26) 13 (14) 19 (20) 17 22 (21) (18) (15) 12 (16) (30) (45)

S.-B. Main Track to Coal Yards (34) (32) (24) (26) 17 22 (21) (18) 15 (30) (19) (20) (46)

Siding to N.-B. Main Track (34) (32) (24) (26) (13) (14) 15 (30) (12) (16) (43)

Siding to S.-B Main Track (34) (32) (24) (26) 13 (14) 19 (20) (17) 22 21 (18) (15) (30) (12) (16) (45) (43)

Siding to Coal Yards (34) (32) (24) (26) 13 (14) 19 (20) 17 22 (21) (18) (15) (30) (12) (16) (45) (43)

C. C. C. & St. L. West-Bound.

Main Track	(14) (18) (20) (29) 15 (16) (33) 35 (34) (31) (32) (10) (9)
Main Track to Siding	(14) (18) (20) (29) 15 (16) (35) 33 (34) (31) (32) (11) (9)

C. C. C. & St. L. East-Bound.

Main Track	(14) (18) (20) (29) 15 (16) (31) (32) (33) (34) (38) (39)
Siding to Main Track	(14) (18) (20) (29) 15 (16) (31) (32) 33 (35) (34) (37)

Wabash West Bound.

Main Track	(14) (18) (20) (29) 15 (16) (25) 27 (26) (23) (24) (8)

Wabash East-Bound.

Main Track	(14) (18) (20) (29) 15 (16) (23) (24) 27 (25) (26) (42)
Main Track to "Y"	15 (16) 19 (20) 23 (24) (25) (27) (26) (17) (22) (18) (40) (41)